

**DOCKET NO.:** DXPZ-0008/02-0478D  
**Application No.:** 10/560,439  
**Office Action Dated:** April 21, 2010

**PATENT**

**Amendments to the Drawings**

The attached sheets of drawings include changes to Fig. 7a. The sheets, which include Figs. 1, 2, 2b, 3, 4, 4b, 5, 6, 7, 7b, 8, 9, and 10, replace the original sheets including Figs. 1, 2, 2b, 3, 4, 4b, 5, 6, 7a, 7b, 8, 9, and 10.

Attachment: Replacement Sheets

### **REMARKS**

Claims 1-19 are pending. Claims 1, 4, 14, and 16 have been amended. Claims 3 and 15 have been canceled. No new matter has been introduced. No claims have been added.

Further prosecution of the application is respectfully requested.

### **OBJECTIONS TO THE DRAWINGS**

The Office has objected to the drawings because of alleged inconsistencies. Without disclaimer, amended drawings are filed with this response. No new matter has been added, as the amendment is for clerical purposes. Reconsideration and withdrawal of the objection is requested.

### **OBJECTION TO THE SPECIFICATION**

The Office has objected to the specification because of alleged multiple abstracts. The specification has been corrected in the manner indicated above. Reconsideration and withdrawal of the object to the specification is requested.

The Office has objected to claim 14 as allegedly missing transitional word, “and”. It appears that the word, “and”, is properly in the claim. The Office is requested to contact the undersigned representative to clarify the objection.

### **REJECTIONS UNDER SECTION 102 - RABINOVICH**

The Office has rejected claims 1-8 and 13-18 under 35 USC Section 102 as allegedly being anticipated by USP No. 5,437,250 to Rabinovich et al. (“Rabinovich”). The Office alleges that because the magnetron of Rabinovich is designed to rotate the plasma that this is the same thing as a vortex flow, as recited in claim 1. This is a technical error.

#### Independent claim 1

The rotation of the plasma within the reactor is not dependant upon the flow pattern of gases within the reactor and mere rotation does not imply in any way that a vortex flow is created. For example, the use of rotational plasma has been used in etching machines for the production of semiconductors. The plasma is rotated to etch (smooth) the surface of the upper layer of the semiconductor wafer during processing. In these machines, the top of the

reaction chamber is covered and the bottom is covered by the wafer. Gases are input into the reactor from the sides and exit from the sides. The plasma that is generated is rotated by electromagnets that are positioned outside of the reaction chamber. The rotating magnetic field rotates the plasma. Thus, in this example, the flow pattern is tangential or horizontal (flow of gases enter and leave through the sides of the reactor). This flow pattern, though accompanied by a rotating plasma, is not the same thing as the vortex flow pattern of claim 1.

Additionally, the arc of Rabinovich is a DC arc plasmatron. A DC arc plasmatron is a plasmatron that operates at thermal equilibrium in which the electron ion and neutral temperatures are comparable. Because of the low voltage, high current characteristics of DC arc plasmatrons, the temperature is typically very high (several thousand degrees), requiring significant amount of cooling capabilities and also causing the relatively short lifespan of electrodes in the plasmatron. Significant cooling such as aggressive water cooling and rotation of the plasma may reduce erosion. The DC arc plasmatron of Rabinovich is in thermal equilibrium.

DC Arc discharges have been otherwise used for applications such as metallurgy, metal welding and metal cutting and are known per se. Arc discharges are formed by the application of a potential to a cathode, and arc discharges are characterized by high current densities and low voltage drops. Factors relevant to these characteristics are the usually short distance between the electrodes (typically a few millimeters) and the mostly inert materials of the electrodes (typically, carbon, tungsten, zirconium, silver, etc). In the case of thermal arc discharge, electrons are generated on a cathode surface because of thermionic emission that requires very high temperature and results in fast cathode erosion. The anode in arc discharges may be either an electrode having a composition identical or similar to the cathode or it may be another conductive material. For example, the anode in arc discharges used in metal welding or cutting is the actual metal to be welded or cut.

In a different manner, the plasma used herein is a non-equilibrium sliding arc discharge. A sliding arc discharge is created by the application of a potential between two electrodes of sufficient distance with sufficient voltage. With an electrical field of sufficient strength, a breakdown of the field occurs between the two electrodes. A gaseous input causes the arc to travel along the electrodes, moving with the flow of gas. The gas is rotated, causing the ever increasing arc to rotate and lengthen. The arc continues to grow in size as

the arc travels along the increasingly distant electrodes until the power input is not sufficient to maintain the arc, which thereafter extinguishes. Effective convective cooling and low current prevent the sliding arc to be in thermal equilibrium.

Thus, the DC arc of Rabinovich uses difference physical properties, is a different type of plasma, and is used in a different manner than the sliding arc discharge of claim 1. Claim 1 has been amended to clarify that the plasma is “non-equilibrium”.

Reconsideration and withdrawal of the rejection to claim 1 under Section 102 is respectfully requested.

Independent claim 14

For at least the reasons discussed above with regards to claim 1, Rabinovich also fails to anticipate claim 14. Reconsideration and withdrawal of the rejection to claim 14 under Section 102 is respectfully requested.

Dependent claims 2-8, 13, and 15-18

The Office has rejected dependent claims 2-8, 13, and 15-18 as allegedly being anticipated by Rabinovich. For at least the reason of their dependence upon an allowable base claim, it follows that claims 2-8, 13, and 15-18 are also allowable. Additionally, the Office erroneously states that Rabinovich teaches “reverse vortex”, as recited in claims 3 and 15. Rabinovich teaches no such thing as reverse vortex flow. Reverse vortex flow is sometimes likened to “tornado flow”, i.e. a flow pattern going up (inside the tornado) and a flow pattern going down (the outside of the tornado which is seen from the outside), with each flow being rotated about a common axis. The only mention in Rabinovich of “vortex” is the stabilization of the plasma, which as discussed above, may not even refer to the flow pattern of the gases in the reactor. For example, as discussed in the semiconductor processing machine above, the vortex may not imply any upward or downward motion, as vortex means simply a spiral motion around a center or axis. Thus, it is in error that the Office relies upon Rabinovich in its finding that Rabinovich discloses the recitations of claims 3 and 15 dealing with “reverse vortex flow”.

Reconsideration and withdrawal of the rejections to claims 2-8, 13, and 15-18 is respectfully requested.

## **REJECTIONS UNDER SECTION 102 - BROWN**

The Office has rejected claims 1-11 and 14-18 under § 102 as allegedly being anticipated by USP No. 6,793,898 B2 to Brown et al. (“Brown”). Brown fails to do so.

### Independent Claim 1

Claim 1 now recites, “creating a reverse vortex flow in said reaction chamber....” Brown uses a forward vortex flow pattern. (Brown: Abstract). The technical features and functionality of a forward vortex flow pattern are significantly different than a reverse vortex flow pattern, as is now claimed in claim 1. For example, in a reverse vortex flow pattern, heat recovery partially occurs within the reactor itself between the inner and outer flows of the reactor whereas, in a forward vortex flow pattern, heat sinks to dissipate heat are typically needed, especially to dissipate heat released in the high voltage electrode. (Brown: col. 5, lines 42-43, “As is illustrated, the first electrode includes at least one heat sink.”).

An additional difference between using a forward vortex flow and a reverse vortex flow is that in a reverse vortex flow pattern, a well-controlled discharge motion along a spiral or a circular electrode may be achieved whereas in a reactor using a forward vortex flow pattern, such as Brown, the discharge is not as controlled. (Brown: col. 6, lines 53-54, “vortex-like motion of the air...causes a pseudo random movement of the discharge.”).

Additionally, the flow elements that create a reverse vortex flow pattern are in a difference configuration than the flow elements that create a forward vortex flow pattern. In a reverse vortex flow reactor, a second axial inlet, used by Brown, may be optional.

For at least these reasons, Brown fails to anticipate claim 1. Reconsideration and withdrawal of the rejection to claim 1 under § 102 is respectfully requested.

### Independent claim 14

For at least the reasons discussed above with regards to claim 1, Brown fails to anticipate claim 14. Reconsideration and withdrawal of the rejection to claim 14 under § 102 is respectfully requested.

Dependent claims 2, 4-11, 16-18

For at least the reason of their dependence upon an allowable base claim, it follows that claims 2, 4-11, 16-18 are also allowable. Reconsideration and withdrawal of the rejections to claims 2, 4-11, 16-18 under § 102 is respectfully requested. As a result of an amendment, claims 3 and 15 have been canceled.

**REJECTIONS UNDER SECTION 103- RABINOVICH AND BROWN**

The Office has rejected claims 9-11 as allegedly being unpatentable over Rabinovich in view of Brown. Because Rabinovich fails to disclose all the recitations of claim 1, it follows that Rabinovich in view of Brown fails to disclose the all the recitations of any claim depending from claim 1. Therefore, it follows that Rabinovich and Brown, when viewed alone or in combination, fail to disclose all recitations of claims 9-11.

**REJECTIONS UNDER SECTION 103- RABINOVICH AND HILLIARD**

The Office has rejected claims 12 and 19 as allegedly being unpatentable over Rabinovich in view of USP No. 4,995,805 to Hilliard ("Hilliard"). Because Rabinovich fails to disclose all the recitations of claim 1 and claim 14, it follows that Rabinovich in view of Hilliard fails to disclose the all the recitations of any claim depending from claim 1 or claim 14. Therefore, it follows that Rabinovich and Hilliard, when viewed alone or in combination, fail to disclose all recitations of claims 12 and 19.

**CONCLUSION**

By the remarks and the amendments provided herein, the Applicant respectfully submits that the Office Action mailed April 21, 2010 has been traversed and that the application is in condition for allowance. If the Examiner has any concerns regarding the response provided herein, or wishes to discuss the response further, the Examiner is invited to contact the undersigned attorney.

The Commissioner is hereby authorized to charge any fee deficiency, charge any additional fees, or credit any overpayment of fees, associated with this application in

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connection with this filing, or any future filing, submitted to the U.S. Patent and Trademark Office during the pendency of this application, to Deposit Account No. 23-3050.

Date: September 16, 2010

/Robert A. Madayag/

Robert A. Madayag  
Registration No. 57,355

Woodcock Washburn LLP  
Cira Centre  
2929 Arch Street, 12th Floor  
Philadelphia, PA 19104-2891  
Telephone: (215) 568-3100  
Facsimile: (215) 568-3439